

WHAT IS CLAIMED IS

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1. A method for fabricating a semiconductor device, comprising the steps of:

forming a barrier conductor layer on a substrate;

10 exposing said barrier conductor layer to a first reducing gas atmosphere at an elevated substrate temperature;

forming, after said step of exposing said barrier conductor layer to said first reducing gas atmosphere, a metal film on said barrier conductor layer by a CVD process; and

15 exposing said metal film to a second reducing gas atmosphere at an elevated substrate temperature.

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2. A method as claimed in claim 1, wherein
25 said first reducing gas atmosphere is selected from any of the group consisting of silane, ammonia and hydrogen.

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3. A method as claimed in claim 1, wherein said step of exposing said barrier conductor layer to

said first reducing gas atmosphere is conducted at a temperature of 250 - 500°C.

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4. A method as claimed in claim 1, wherein said second reducing gas atmosphere is selected from any or more of hydrogen and nitrogen.

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5. A method as claimed in claim 1, wherein said step of exposing said metal film to said second reducing gas atmosphere is conducted at a temperature of 250 - 500°C.

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6. A method as claimed in claim 1, wherein said metal film is a Cu film.

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7. A method as claimed in claim 1, wherein said barrier conductor layer is formed of any of Ta or TaN.

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8. A method of fabricating a semiconductor device, comprising the steps of:

forming a barrier conductor layer of any of tungsten nitride or tantalum nitride on a substrate;

5 exposing said barrier conductor layer to a plasma of a reducing gas at an elevated temperature; and

forming, after said step of exposing said barrier conductor layer to said plasma, a metal film
10 on said barrier conductor layer by a CVD process.

15 9. A method as claimed in claim 8, wherein said reducing gas is hydrogen.

20 10. A method as claimed in claim 8, wherein said step of exposing said barrier conductor layer to said plasma is conducted at a temperature of 50 - 400°C.

25 11. A method as claimed in claim 8, further comprising, after said step of forming said metal film, a thermal annealing process applied to said metal film in a reducing gas atmosphere.

12. A method as claimed in claim 11,
wherein said thermal annealing process is conducted
at a temperature of 250 - 500°C.

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13. A method as claimed in claim 8, wherein
said metal film is formed of Cu.

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14. A method of fabricating a semiconductor
15 device, comprising the steps of:

alternately and repeatedly forming, on a
substrate, an insulating film, a barrier conductor
layer of any of tungsten nitride and tantalum nitride,
and a metal film, said metal film being formed by a
20 CVD process,

wherein a step of exposing said barrier
conductor film to a plasma of a reducing gas at an
elevated temperature is interposed between said step
of forming said barrier conductor layer and said step
25 of forming said metal film.